

1 AP20 Rec'd PCT/PTO 10 FEB 2006

Carrier based on granules produced from pyrogenically prepared silicon dioxides

The present invention relates to the use of granules of pyrogenic silica as carriers. In addition to various other actions, the granules can have the function of a carrier for foodstuffs additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as, for example, herbicides, insecticides, fungicides and others.

It is known to employ spherical silicon dioxide particles as carriers, for example for feedstuffs additives (Sipernat 22, Bulletin Pigments No. 31, "Synthetic Silica as a Flow Acid and Carrier Substance", Degussa AG).

Disadvantages of the abovementioned silicon dioxide particles which are employed as carriers are their high water content, their too low purity and the poor flow properties of the loaded substance. Silicic acid esters, silica sols or silicates are employed as starting compounds, and then often lead to products of which the purity is not adequate for the desired intended uses because of considerable amounts of salts, so that an expensive washing is necessary.

The invention is therefore based on the object of providing spherical silicon dioxide particles for use as carriers which do not have the disadvantages mentioned and moreover meet the high demands of uses in respect of purity, product safety and flow properties.

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The invention provides the use of granules based on pyrogenically prepared silicon dioxide as a carrier for substances chosen from the group consisting of foodstuffs additives, such as dyestuffs, antioxidants, preservatives, 5 emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as herbicides, insecticides, fungicides and 10 others.

The invention also provides an adsorbate of granules based on pyrogenically prepared silicon dioxide and at least one substance chosen from the group consisting of foodstuffs additives, such as dyestuffs, antioxidants, preservatives, 15 emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as herbicides, insecticides and fungicides.

20 The granules based on pyrogenically prepared silicon dioxide preferably have an average particle diameter of 10 to 120 µm and a BET surface area of 40 to 400 m²/g (determination in accordance with DIN 66 131 with nitrogen).

25 The silicon dioxide granules furthermore preferably have the following physico-chemical characteristic data, which are determined as described in EP PS 0 725 037:

Pore volume: 0.5 to 2.5 ml/g

30 Pore size distribution: less than 5% of the total pore volume has a pore diameter of less than 5 nm, remainder meso- and macropores

pH: 3.6 to 8.5

Tamped density: 220 to 700 g/l.

Granules which are suitable for the use according to the invention and the preparation thereof are described, for example, in EP OS 0 727 037.

The granules can preferably have meso- and macropores, the 5 volume of the mesopores making up 10 to 80% of the total volume. The particle size distribution of the granules is preferably 80 vol.% larger than 8 µm and 80 vol.% smaller than 96 µm. In a preferred embodiment of the invention, the content of pores smaller than 5 µm is not more than 5%, 10 based on the total pore volume.

The granules employed according to the invention can be prepared, for example, by dispersing pyrogenically prepared silicon dioxide, preferably silicon dioxide prepared from silicon tetrachloride by means of flame hydrolysis, in 15 water, spray drying the dispersion and optionally then heat-treating the resulting granules at a temperature of 150 to 1,100°C for a period of 1 to 8 h.

The dispersion in water preferably has a concentration of silicon dioxide of 5 to 25 wt.%, more preferably 5 to about 20 19.9 wt.%. The spray drying can be carried out at a temperature of 200 to 600°C, and disc atomizers or nozzle atomizers can be employed in this context. The heat treatment of the granules can be carried out either in a static bed, such as, for example, in chamber ovens, or in 25 an agitated bed, such as, for example, rotary tubular dryers.

The pyrogenic silicon dioxide serving as the starting compound is prepared by a process in which a volatile silicon compound is injected into an oxyhydrogen gas flame 30 of hydrogen and air. Silicon tetrachloride is used in most cases. This substance hydrolyses to silicon dioxide and hydrochloric acid under the influence of the water formed during the oxyhydrogen gas reaction. After leaving the flame the silicon dioxide enters into a so-called

coagulation zone, in which the silicon dioxide primary particles and primary aggregates agglomerate. The product present as a type of aerosol in this stage is separated from the gaseous concomitant substances in cyclones and 5 then after-treated with damp hot air. The residual hydrochloric acid content can be lowered to below 0.025% by this process.

The granules based on pyrogenically prepared silicon dioxide can be silanized. The carbon content of the 10 granules is then preferably 0.3 to 15.0 wt.%. Halogenosilanes, alkoxy silanes, silazanes and/or siloxanes can be employed for the silanization.

The following substances can be employed in particular as halogenosilanes:

15 Halogeno-organosilanes of the type $X_3Si(C_nH_{2n+1})$

X = Cl, Br
n = 1 - 20

Halogeno-organosilanes of the type $X_2(R')Si(C_nH_{2n+1})$

20 X = Cl, Br
R' = alkyl
n = 1 - 20

Halogeno-organosilanes of the type $X(R')_2Si(C_nH_{2n+1})$

25 X = Cl, Br
R' = alkyl
n = 1 - 20

Halogeno-organosilanes of the type $X_3Si(CH_2)_m-R'$

X = Cl, Br
 m = 0,1 - 20
 R' = alkyl, aryl (e.g. -C₆H₅)
 -C₄F₉, -OCF₂-CHF-CF₃, -C₆F₁₃, -O-CF₂-CHF₂
 5 -NH₂, -N₃, -SCN, -CH=CH₂,
 -OOC(CH₃)C=CH₂
 -OCH₂-CH(O)CH₂
 —NH—CO—N—CO—(CH₂)₅—
 —
 -NH-COO-CH₃, -NH-COO-CH₂-CH₃, -NH-(CH₂)₃Si(OR)₃
 10 -S_x-(CH₂)₃Si(OR)₃

Halogeno-organosilanes of the type (R)X₂Si(CH₂)_m-R'

X = Cl, Br
 R = alkyl
 m = 0,1 - 20
 15 R' = alkyl, aryl (e.g. -C₆H₅)
 -C₄F₉, -OCF₂-CHF-CF₃, -C₆F₁₃, -O-CF₂-CHF₂
 -NH₂, -N₃, -SCN, -CH=CH₂,
 -OOC(CH₃)C=CH₂
 -OCH₂-CH(O)CH₂
 —NH—CO—N—CO—(CH₂)₅—
 20 —
 -NH-COO-CH₃, -NH-COO-CH₂-CH₃, -NH-(CH₂)₃Si(OR)₃
 -S_x-(CH₂)₃Si(OR)₃

Halogeno-organosilanes of the type (R)₂X Si(CH₂)_m-R'

X = Cl, Br
 R = alkyl
 m = 0,1 - 20
 R' = alkyl, aryl (e.g. -C₆H₅)
 -C₄F₉, -OCF₂-CHF-CF₃, -C₆F₁₃, -O-CF₂-CHF₂
 -NH₂, -N₃, -SCN, -CH=CH₂,
 30 -OOC(CH₃)C=CH₂
 -OCH₂-CH(O)CH₂
 —NH—CO—N—CO—(CH₂)₅—
 —

$-\text{NH}-\text{COO}-\text{CH}_3$, $-\text{NH}-\text{COO}-\text{CH}_2-\text{CH}_3$, $-\text{NH}- (\text{CH}_2)_3\text{Si}(\text{OR})_3$
 $-\text{S}_x-(\text{CH}_2)_3\text{Si}(\text{OR})_3$

The following substances can be employed in particular as alkoxysilanes:

5 Organosilanes of the type $(\text{RO})_3\text{Si}(\text{C}_n\text{H}_{2n+1})$

R = alkyl

n = 1 - 20

Organosilanes of the type $\text{R}'_x(\text{RO})_y\text{Si}(\text{C}_n\text{H}_{2n+1})$

R = alkyl

10 R' = alkyl

n = 1 - 20

x+y = 3

x = 1,2

y = 1,2

15 Organosilanes of the type $(\text{RO})_3\text{Si}(\text{CH}_2)_m-\text{R}'$

R = alkyl

m = 0,1 - 20

R' = alkyl, aryl (e.g. $-\text{C}_6\text{H}_5$)

$-\text{C}_4\text{F}_9$, $\text{OCF}_2-\text{CHF}-\text{CF}_3$, $-\text{C}_6\text{F}_{13}$, $-\text{O}-\text{CF}_2-\text{CHF}_2$

20 $-\text{NH}_2$, $-\text{N}_3$, $-\text{SCN}$, $-\text{CH}=\text{CH}_2$,

$-\text{OOC}(\text{CH}_3)\text{C}=\text{CH}_2$

$-\text{OCH}_2-\text{CH}(\text{O})\text{CH}_2$

$\text{---NH---CO---N---CO---(CH}_2)_5\text{---}$

$-\text{NH}-\text{COO}-\text{CH}_3$, $-\text{NH}-\text{COO}-\text{CH}_2-\text{CH}_3$, $-\text{NH}- (\text{CH}_2)_3\text{Si}(\text{OR})_3$

25 $-\text{S}_x-(\text{CH}_2)_3\text{Si}(\text{OR})_3$

Organosilanes of the type $(\text{R}'')_x(\text{RO})_y\text{Si}(\text{CH}_2)_m-\text{R}'$

R'' = alkyl

x+y = 2

30 x = 1,2

$y = 1, 2$

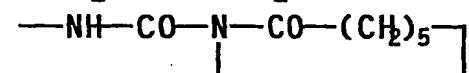
$R' = \text{alkyl, aryl (e.g. } -C_6H_5)$

$-C_4F_9, -OCF_2-CHF-CF_3, -C_6F_{13}, -O-CF_2-CHF_2$

$-NH_2, -N_3, -SCN, -CH=CH_2,$

5 $-OOC(CH_3)C = CH_2$

$-OCH_2-CH(O)CH_2$



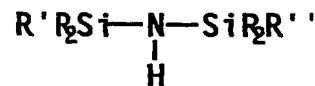
$-NH-COO-CH_3, -NH-COO-CH_2-CH_3, -NH-(CH_2)_3Si(OR)_3$

$-S_x-(CH_2)_3Si(OR)_3$

- 10 The silane Si 108 $[(CH_3O)_3-Si-C_8H_{17}]$ trimethoxyoctylsilane can preferably be employed as the silanizing agent.

The following substances can be employed in particular as silazanes:

Silazanes of the type:



15

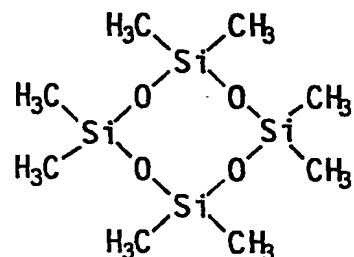
$R = \text{alkyl}$

$R' = \text{alkyl, vinyl}$

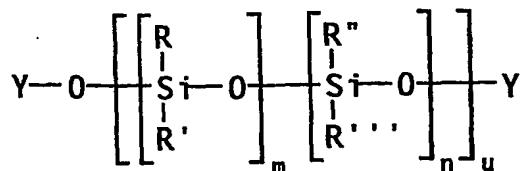
and, for example, hexamethyldisilazane.

- 20 The following substances can be employed in particular as siloxanes:

Cyclic polysiloxanes of the type D 3, D 4, D 5, e.g. octamethylcyclotetrasiloxane = D 4



Polysiloxanes or silicone oils of the type:



R = alkyl, aryl, $(CH_2)_n - NH_2$, H

R' = alkyl, aryl, $(CH_2)_n - NH_2$, H

5 R'' = alkyl, aryl, $(CH_2)_n - NH_2$, H

R''' = alkyl, aryl, $(CH_2)_n - NH_2$, H

Y = CH_3 , H, C_nH_{2n+1} where n=1-20

Y = $Si(CH_3)_3$, $Si(CH_3)_2H$

$Si(CH_3)_2OH$, $Si(CH_3)_2(OCH_3)$

10 $Si(CH_3)_2(C_nH_{2n+1})$ where n=1-20

m = 0,1,2,3,...∞

n = 0,1,2,3,...∞

u = 0,1,2,3,...∞

15 The silanization can be carried out by a procedure in which the granules are sprayed with the silanizing agent, which can optionally be dissolved in an organic solvent, such as, for example, ethanol, and the mixture is then heat-treated at a temperature of 105 to 400°C over a period of 1 to 6 h.

20 An alternative method of the silanization of the granules can be carried out by a procedure in which the granules are treated with the silanizing agent in vapour form and the mixture is then heat-treated at a temperature of 200 to 800°C over a period of 0.5 to 6 h. The heat treatment can 25 be carried out under an inert gas, such as, for example, nitrogen.

The silanization can be carried out continuously or batchwise in heatable mixers and dryers with spray devices. Suitable devices can be, for example: plough share mixers

30 or plate, fluidized bed or flow-bed dryers.

By varying the starting substances, the conditions during spraying, the heat treatment and the silanization, the physico-chemical parameters of the granules, such as the specific surface area, the particle size distribution, the 5 pore volume, the tamped density and the silanol group concentration, pore distribution and pH, can be modified within the stated limits.

The invention also provides:

- Dyestuff comprising granules based on pyrogenically prepared silicon dioxide.
- Antioxidant comprising granules based on pyrogenically prepared silicon dioxide.
- Preservative comprising granules based on pyrogenically prepared silicon dioxide.
- 15 - Emulsifier comprising granules based on pyrogenically prepared silicon dioxide.
- Gelling agent comprising granules based on pyrogenically prepared silicon dioxide.
- Thickener comprising granules based on pyrogenically prepared silicon dioxide.
- 20 - Binder comprising granules based on pyrogenically prepared silicon dioxide.
- Stabilizer comprising granules based on pyrogenically prepared silicon dioxide.
- 25 - Alkali comprising granules based on pyrogenically prepared silicon dioxide.
- Acids comprising granules based on pyrogenically prepared silicon dioxide.

- Salts comprising granules based on pyrogenically prepared silicon dioxide.
 - Antilumping agent comprising granules based on pyrogenically prepared silicon dioxide.
- 5 - Flavour intensifier comprising granules based on pyrogenically prepared silicon dioxide.
- Sweetener comprising granules based on pyrogenically prepared silicon dioxide.
 - Aroma comprising granules based on pyrogenically
- 10 prepared silicon dioxide.
- Feedstuffs additives comprising granules based on pyrogenically prepared silicon dioxide.
 - Chemical intermediates comprising granules based on pyrogenically prepared silicon dioxide.
- 15 - Plant protection agents comprising granules based on pyrogenically prepared silicon dioxide.
- Herbicides comprising granules based on pyrogenically prepared silicon dioxide.
 - Insecticides comprising granules based on pyrogenically
- 20 prepared silicon dioxide.
- Fungicides comprising granules based on pyrogenically prepared silicon dioxide.

Foodstuffs additives can be:

Dyestuffs, such as, for example:

- E100 Curcumin
- E101 Riboflavin, Lactoflavin
- 5 E102 Tartrazine
- E104 Quinoline Yellow
- E110 Sunset Yellow S (azo dyestuff)
- E120 Carminic acid, Cochineal
- E122 Azorubine (azo dyestuff)
- 10 E123 Amaranth (azo dyestuff)
- E124 Ponceau 4R (azo dyestuff)
- E127 Erythrosine
- E131 Patent Blue V
- E132 Indigotine, Indigo Carmine
- 15 E140 Chlorophylls a + b
- E141 Chlorophylls und Chlorophyllins,
copper complexes
- E142 Acid Brilliant Green BS
- E150 Caramel, Sugar colour, Rum colour
- 20 E151 Brilliant Black BN (azo dyestuff)
- E153 Charcoal, medicinal
- E160 Carotenoids
- E160a Beta-Carotene, Gamma-Carotene
- E160b Bixin, Norbixin, (Annatto), Orlean
- 25 E160c Capsanthin, Capsorubin
- E160d Lycopene
- E160e Beta-Apo-8'-Carotenal (C30)
- E160f Beta-Apo-8'-Carotenoic Acid Ethyl Ester
- E161 Xanthophylls
- 30 E161a Flavoxanthin
- E161b Lutein
- E161c Cryptoxanthin
- E161d Rubixanthin
- E161e Violaxanthin
- 35 E161f Rhodoxanthin

E161g Canthaxanthin
E162 Betanin, Beetroot Red
E163 Anthocyan
E172 Iron oxide, iron hydroxide
5 E173 Aluminium
E174 Silver
E175 Gold
E180 Pigment Rubine BK, Lithol Rubine

10 Antioxidants can be:

E220 Sulfurous acid, sulfur dioxide
E221 Sodium sulfite
E222 Sodium hydrogen sulfite
E223 Sodium disulfite
15 E224 Potassium disulfite
E300 Ascorbic acid
E301 Sodium ascorbate
E302 Calcium ascorbate
E304 Ascorbyl palmitate
20 E306 Tocopherol-containing extracts of natural
origin
E307 alpha-Tocopherol
E308 gamma-Tocopherol
E309 delta-Tocopherol
25 E310 Propyl gallate
E311 Octyl gallate
E312 Dodecyl gallate
E320 Butylhydroxyanisole (BHA)
E321 Butylhydroxytoluene (BHT)
30 E330 Citric acid
E331 Sodium citrate
E332 Potassium citrate
E333 Calcium citrate
E472c Citric acid esters
35 Ethoxiquin

Preservatives can be:

- E200 Sorbic acid
- E201 Sodium sorbate
- E202 Potassium sorbate
- 5 E203 Calcium sorbate
- E210 Benzoic acid
- E211 Sodium benzoate
- E212 Potassium benzoate
- E213 Calcium benzoate
- 10 E214 Ethyl 4-hydroxybenzoate
- E215 Ethyl 4-hydroxybenzoate, sodium salt
- E216 Propyl 4-hydroxybenzoate
- E217 Propyl 4-hydroxybenzoate, sodium salt
- E218 Methyl 4-hydroxybenzoate
- 15 E219 Methyl 4-hydroxybenzoate, sodium salt
- E220 Sulfurous acid, sulfur dioxide
- E221 Sodium sulfite
- E222 Sodium hydrogen sulfite
- E223 Sodium disulfite
- 20 E224 Potassium disulfite
- E236 Formic acid
- E280 Propionic acid
- E281 Sodium propionate
- E282 Calcium propionate
- 25 E283 Potassium propionate

Emulsifiers can be:

- E322 Lecithin
- E442 Ammonium salts of phosphatidic acids
- E471 Edible fatty acids, mono- and
30 diglycerides
- E472 Esters of E471
- E472a Acetic acid esters
- E472b Lactic acid esters
- E472c Citric acid esters
- 35 E472d Tartaric acid esters

- E472e Diacetyl tartaric acid esters
E472f Tartaric-acetic acid esters
E473 Sucrose esters of edible fatty acids
E474 Sugar glycerides
5 E475 Polyglycerol esters of edible fatty acids
E476 Polyglycerol esters of polycondensed
 ricinoleic acid
E477 Propylene glycol esters of edible fatty
 acids
10 E481 Sodium stearoyllactylate
E482 Calcium stearoyllactylate
E487 Sdodium lauryl sulfate

Gelling agents, thickeners and binders and stabilizers can
15 be:

- E400 Alginic acid
E401 Sodium alginate
E402 Potassium alginate
E403 Ammonium alginate
20 E404 Calcium alginate
E405 Propylene glycol alginate
E406 Agar-agar
E407 Carrageenan
E410 Carob bean flour
25 E412 Guar flour
E413 Tragacanth
E414 Gum arabic
E415 Xanthan
E416 Karaya gum
30 E417 Tara gum
E440 Pectins
E460a Cellulose, microcrystalline
E460b Cellulose, powdered
E461 Methylcellulose
35 E463 Hydroxypropylcellulose

- E464 Hydroxypropylmethycellulose
E465 Methylethylcellulose
E466 Carboxymethylcellulose
E551 Silicon dioxide
5 E1411 Di-starch phosphate I
E1412 Di-starch phosphate II
E1413 Di-starch phosphate, phosphated
E1414 Di-starch phosphate, acetylated
E1420 Mono-starch acetate I
10 E1421 Mono-starch acetate II
E1422 Di-starch adipate, acetylated
E1423 Di-starch glycerol, acetylated
E1430 Di-starch glycerol
E1440 Hydroxypropyl-starch
15 E1441 Hydroxypropyl-di-starch glycerol
E1442 Hydroxypropyl-di-starch phosphate

Alkalis, acids and salts can be:

- 20 E170 Calcium carbonate
E260 Acetic acid
E261 Potassium acetate
E262 Sodium diacetate
E263 Calcium diacetate
E270 Lactic acid
25 E296 Malic acid
E325 Sodium lactate
E326 Potassium lactate
E327 Calcium lactate
E330 Citric acid
30 E331 Sodium citrate
E332 Potassium citrate
E333 Calcium citrate
E334 Tartaric acid
E335 Sodium tartrate
35 E336 Potassium tartrate

- E337 Potassium sodium tartrate
E354 Calcium tartrate
E338 Orthophosphoric acid
E339 Sodium orthophosphate
5 E340 Potassium orthophosphate
E341 Calcium orthophosphate
E343 Magnesium orthophosphate
E350 Sodium malate
E351 Potassium malate
10 E352 Calcium malate
E450 Salts of di-, tri- and polyphosphoric acid (di-, tri- and polyphosphates)
E500 Sodium carbonate
E501 Potassium carbonate
15 E503 Ammonium carbonate
E504 Magnesium carbonate
E507 Hydrochloric acid
E508 Potassium chloride
E509 Calcium chloride
20 E510 Ammonium chloride
E514 Sodium sulfate
E515 Potassium sulfate
E516 Calcium sulfate
E524 Sodium hydroxide
25 E525 Potassium hydroxide
E526 Calcium hydroxide
E527 Ammonium hydroxide
E528 Magnesium hydroxide
E529 Calcium oxide
30 E530 Magnesium oxide
E541 Sodium aluminium phosphate
E574 Gluconic acid
E575 Glucono-delta-lactone
E576 Sodium gluconate
35 E577 Potassium gluconate
E578 Calcium gluconate

Antilumping agents can be:

- E170 Calcium carbonate
E341 Calcium orthophosphate
E470 Edible fatty acids, sodium, potassium and
5 calcium salts
E504 Magnesium carbonate
E535 Sodium ferrocyanide
E536 Potassium ferrocyanide
E538 Calcium ferrocyanide

10

Flavour intensifiers can be:

- E621 Sodium glutamate
E622 Potassium glutamate
15 E623 Calcium glutamate
E624 Magnesium glutamate
E625 Ammonium glutamate
E627 Sodium guanylate
E628 Potassium guanylate
20 E629 Calcium guanylate
E630 5'-Inosinic acid
E631 Sodium inosinate
E632 Potassium inosinate
E633 Calcium inosinate

25

Sweeteners can be:

- E950 Acesulfame-K
E951 Aspartame
E952 Cyclamate
30 E954 Saccharin
E957 Thaumatin

Aromas:

- Abriceine
Acetanisole cryst.
Acetophenone pure
5 Agar wood D50092NS
Agrumen aldehyde 6947L
Agrumex HC
Agrumex LC
Agrumovert 10897 C/J
10 Aldehyde C 6 nat.
Aldehyde C11 MOA
Aldehyde C12 MNA
Aldehyde C14 so-called
Aldehyde C16 so-called
15 Aldehyde C18 so-called/Abricolin
Alcohol C 6 nat.
Alcohol C 8
Alcohol C 9
Alcohol C10
20 Alcohol C12
Allinat/Allyl isothiocyanate
Allinat/Allyl isothiocyanate (stab.)
Allyl caproate
Allyl caproate kosher
25 Allyl cyclohexylpropionate
Allyl heptylate
Allyl phenoxyacetate
Amarocit ®
Ambre 83LN DB10028
30 Ambrebois D50407
Ambrettia C
Ambrettolide
Ambrinol S
Ambroxid cryst.
35 Ananas Coeur D50214
Anethol NPU 21/22°C

Anethol supra 21.5°C
Anisaldehyde pure
Anisyl alcohol
Anisole
5 Anisyl acetate
Apple 74180C PM
Apriconia 28855P extra PM
Baldrian Identoil B
Basilicum Synthessence
10 Bay Identoil
Benzalacetone
Benzaldehyde
Benzaldehyde dd
Benzophenone cryst.
15 Benzyl acetate
Benzyl acetone
Benzyl alcohol dd
Benzyl alcohol FR
Benzyl benzoate H&R
20 Benzyl benzoate M
Benzyl cinnamate
Benzyl formate
Benzyl propionate
Benzyl salicylate
25 Bergamot Identoil colourless
Bergamot Synthessence Afric.
Blackberry D50260E
Bois de Cachemire D50008
Bois Doux 78008SP PM
30 Boronal
Butyric acid nat.
Butyl butyrate
Cacao et Chocolat D50546B
Cajeput Identoil
35 Calmus Synthessence asarone-free
Cananga Identoil
Capric acid nat.

Caproic acid nat.
Caramel acetate
Cardamom R Identoil
Cardamom Synthessence
5 Cassia Identoil
Cassia Identoil B dark
Cassis D50060B
Cedar Leaves Identoil
Chloracetophenone para
10 Chrysantheme
Cinnamyl acetate
Citral FF
Citron R
Citrone Synthessence FF
15 Citronella Identoil
Citronell Identoil
Citronellyl tiglinate
Citronitrile
Citrowanil® B
20 Citrozone D50620B
Citrylal
Citrylal E
Clarifruit D50757
Clarion Base D50774
25 Coriander Identoil
Corps 98N DB10025
Corps Racine VS
Costus Synthessence
Coumarone
30 Cumin Synthessence
Cypress Identoil
Damascenone beta nat. 1% in EtOH
Datilat
Decalactone gamma nat.
35 Decalyl acetate beta
Diacetyl nat.
Dibenzosuberenone

Dibenzosuberone
Dibenzyl ether
Diethyl phthalate (DEP)
Dihydrocoumarin
5 Dimethyl anthranilate
Dimethyl benzyl carbonyl butyrate
Dimethyl sulfide nat.
Diphenyl oxide
Silver Fir Needle Identoil
10 Silver Fir Needle Identoil B
Oak Moss Resin D50342
Strawberry D50026C
Acetic acid nat.
Estragon Identoil
15 Ethoxyfuranone
Ethyl 2-methylbutyrate nat.
Ethyl 2-methylbutyrate
Ethyl acetate nat.
Ethyl acetoacetate
20 Ethyl benzoate
Ethyl butyrate
Ethyl butyrate nat.
Ethyl caproate kosher
Ethyl caproate nat.
25 Ethyl caprylate
Ethyl caprylate nat.
Ethyl cinnamate
Ethyl formate
Ethyl heptylate
30 Ethyl isovalerate
Ethyl phenylacetate
Ethyl propionate
Ethyl salicylat
Eucalyptol
35 Eucalyptus Oil Globulus BP
Eugenol
Eugenol methyl ether

Farenal
Fennel oil techn.
Feuilles de Tomate 79569PM
Spruce Green 8001S
5 Spruce Needle Identoil B sib.
Spruce Needle Identoil sib.
Filbertone G
Fir Balsam DM
Fleur de Cassis SBU PM
10 Floropal
Florophyll 10183
Fragolane
Framboson 10583F
Frutinat
15 Galbanum Synthessence
Galbanum Synthresin B
Geranium Identoil Afric.
Geranium Identoil Bourbon
Geranyl tiglinate
20 Globalide 100%
Globanone 50% DEP
Globanone 50% DPG
Globanone 50% IPM
Grapefruit D50075N
25 Grapefruit Identoil D61286G
Green Honey Melon D50315
Guave 10875N
Helichrysum Synthessence
Herbaflorat
30 Hexyl acetate
Hexyl acetate nat.
Hexyl salicylate
Hydrocitronitrile
Indian Spice 10898
35 Indoflor H&R cryst.
Indole FF
Ginger oil spec. D40393S

Ionone pure 100%
Iris Synthresin H&R
Irolene P
Isoamyl acetate G
5 Isoamyl acetate nat.
Isoamyl butyrate
Isoamyl butyrate nat.
Isoamyl isobutyrate nat.
Isoamyl isovalerate
10 Isoananate
Isobornyl acetate
Isobutyric acid nat.
Isobutyl acetat nat.
Isobutylquinoline
15 Isobutylquinoline 54
Isoeugenol methyl ether
Isotabac naturelle LN DB10038
Jasmaprunat
Camomile Identoil blue
20 Camomile rom. Synthessence
Pine Needle Identoil
Pine Needle Identoil B
Pine Needle Identoil B P
Kiwi D50195PM
25 Cresol methyl ether para
Lactojasmon
Lavandin Identoil 30/32%
Lavandin Identoil type French 30/32%
Lavandin Provence D50817
30 Lavender Identoil type Mt. Blanc 40/42%
Lavender oil type Mt. Blanc 40/42%
Leguminal
Limonene d pure
Loganberry D50398N PM
35 Bay Leaf Oil D50286
Mace Oil extra
Macrolide®

Macrolide® supra
Madranol
Magnolan
Majantol
5 Mandaril
Manderine Synthessence
Mango D50436PM
Maracuja D50042E PM
Marjoliane N DB10018
10 Mayciane N DB10023
Melissa Identoil German so-called
Menthol D dist.
Menthol liquid
Menthol rac.
15 Menthol rac. PH
Menthol-1 dest.
Menthol-1 H&R compacted
Menthol oil
Menthone-1/Isomenthone-d
20 Menthyl acetate-1
Metaxa D50247C
Methyl ethylpyrazine-2,3
Methyl 2-methylbutyrate
Methylacetophenone para
25 Methylacetophenone para supra
Methyl anthranilate
Methyl benzoate H&R
Methyl benzoate techn. pure
Methyl betanaphthyl ketone cryst.
30 Methylbutyric acid-2 nat.
Methyl cinnamate
Methyl phenylacetate
Methyl salicylate
Methyl cinnamaldehyde alpha
35 Miel Blanc N DB10024
Musk Seed Synthessence
Mugetanol

Mugofleur D50444PM
Clary Sage Identoil
Clary Sage Identoil B
Carnation Flower Identoil
5 Clove Leaf Identoil dark
Clove Leaf Oil deg.
Neononyl acetate
Neroli Identoil
Nerolin Yara Yara cryst.
10 Neroli oil 4663
Olibanum Synthresin
Orange Identoil TSA
Orange oil spec. D40393P
Origanum Identoil
15 Oryclon extra
Oryclon special
Osmanthia 353
Ozonil
Palisandal
20 Palisandin
Palmarosa Synthessence
Pastinak Synthessence
Patchouli Synthessence N
Patchouli oil deg. DM
25 Pear D50313A PM
Peru Balsam Identoil
Peru balsam art. H&R
Petitgrain Bigarade Synthessence
Petitgrain Identoil R
30 Peach D40110PM
Plum D50424
Phenirate
Phenoxyethyl alcohol/arosol
Phenylacetaldehyde 100%
35 Phenylacetaldehyde dimethyl acetal
Phenylethyl acetate
Phenylethyl alcohol benzyl alcohol-free

Phenylethyl alcohol pure
Phenylethyl cinnamate cryst.
Phenylethyl isobutyrate
Phenylethyl phenylacetate
5 Phenylpropyl alcohol
Pimento Identoil
Pineapple acetate
Poivre Coeur H&R PM
Poivron N DB10029
10 Prenyl acetate
Prenyl salicylate
Profarnesal
Projasmon P
Propionic acid nat.
15 Propyl acetate nat.
Prunol N DB10027
Pyroprunat
Rain Forest D50339C PM
Resedafol
20 Rosaphen
Rose Booster D50221A
Rose F50048R PG
Rosemary Identoil
Rosemary Identoil Spanish
25 Rosewood Braz. Identoil
Sage Identoil Span.
Sage Identoil Span.
Sandalwood S.E.A. D50820
Sandel 80
30 Sandel extra
Sandel Forte
Sandel H&R
Sandel H&R ECO
Sandel H&R super
35 Sandel SP
Sandel type East Ind.
Sandalwood type East Ind.

- Sandolene H&R
Spike Identoil
Styrax Identoil D50186
Styrenyl acetate
5 Sweet Amber D50807
Tobacco aroma H&R D50799
Teatree D50780A
Thyme Identoil
Thyme red Identoil
10 Thyme Synthabsolute
Thymol dist.
Thymol cryst. H&R
Thymol cryst. PH
Tonca Synthresin
15 Vanillin nat.
Verbena Identoil type French
Verdeflora D50375D
Verdural F
Vertocitral
20 Vertocitral C
Vertosine
Vetiver Identoil J
Juniper berry Identoil 10900
Juniper berry Synthessence
25 Willow fragrance 6103CB HG
Wintergreen oil
Ylang 10372 MT
Ylang Ylang Identoil Bourbon I
Ylang Ylang Identoil Bourbon II
30 Ylang Ylang Identoil Bourbon III
Cinnamaldehyde
Cinnamaldehyde nat.
Cinnamyl alcohol
Cinnamon leaf Identoil
35 Cinnamon bark Identoil

Feedstuffs additives can be:

- Choline chloride solution
- Vitamin E acetate
- Formic acid
- 5 Acetic acid
- Propionic acid
- Phosphoric acid
- Fat concentrates
- Ethoxiquin
- 10 Molasses
- Hop extract
- Tagetese extract
- Lecithin
- Whey
- 15 Calcium formiate
- Urea
- Milk substitute
- Trace elements
- vitamins

20

Chemical intermediates can be:

- 1,2-Propylene glycol
- Acrylic acid
- Adipic acid
- 25 Adipic anhydride
- Formic acid
- Formic anhydride
- Benzoic acid
- Succinic acid
- 30 Butanoic acid
- Butanoic anhydride
- Caproic acid
- Dimer fatty acid
- Dimer fatty acid anhydride

Dipentaerythritol
Erucic acid
Acetic acid
Acetic anhydride
5 Ethylene glycol
Fumaric acid
Glutaric acid
Glycerol
Isophthalic acid
10 Isophthalic anhydride
Lauric acid
Linolenic acid
Linoleic acid
Maleic acid
15 Maleic anhydride
Malonic acid
Myristic acid
Oleic acid
Oxalic acid
20 Palmitic acid
Pentaerythritol
Phthalic acid
Phthalic anhydride
Propionic acid
25 Stearic acid
Terephthalic acid
Terephthalic anhydride
Trimethylolpropane
Valeric acid
30 Bisphenol A
Epichlorohydrin
o-Cresol
Phenol novolaks
Styrene
35 α -Methylstyrene
Vinyltoluene
Methyl methacrylate

Divinylbenzene
Diallyl phthalate
Diisocyanates
Toluene-diisocyanates
5 Cyclohexanone
Methylcyclohexanone
Acetone
Butanone
Acetophenone
10 Indene
Coumarone (benzofuran)
2-Methylindene
2-Methylcoumarone
Methylstyrene
15 Cyclopentadiene
Dicyclopentadiene
Heteropolysaccharides
Arabinose
Galactose
20 Glucoronic acid
Mannose
Rhamnose
Xylose
Resinol acids
25 Resinols
Resinotannols
Resenes
Terpenes
Diterpenes
30 Triterpenes
Sesquiterpenes
Resin esters
Resin soaps
Alcohols
35 Phenol derivatives
Hydroquinone derivatives
Quinoline derivatives

Naturally occurring resins:

Acaroid resin
Asa foetida
Benzoin resin
5 Amber
Bitumen
Canada balsam
China lacquer
Copaiva balsam
10 Dammar resin
Dragon's blood resin
Elemi
Galbanum
Gutti
15 Jalap resin
Japan lacquer
Kauri copal
Colophony
Copal
20 Labdanum
Manila copal
Mastix
Myrrh
Olibanum
25 Opopanax
Pernambuco balsam
Peru balsam
Sandarac
Shellac
30 Styrax
Tolu balsam
Terpentine

Synthetic resins:

35 Hydrocarbon resins
Urea resins

Alkyd resins
Epoxy resins
Melamine resins
Melamine-formaldehyde resins
5 Hexamethylolmelamine resins
Melamine-phenol resins
Melamine-urea resins
Phenolic resins
Polyester resins
10 Unsaturated polyester resins
Polyurethane resins
Ketone resins
Coumarone-indene resins
Isocyanate resins
15 Polyamide resins
Terpene-phenol resins
Epoxy resins
Rubber

Additives:

20 Wetting agents
Desiccants
Antifloating agents
Antiskinning agents
Hardening accelerators
25 Hardening retardants
Expanding agents
Sealants
Water softeners
Deoxygenating agents
30 Buffers
Polishing agents
Antiageing agents
Antioxidants
Antiozonants
35 Plasticizers

- Deodorizers
- Inhibitors
- Passivating agents
- Pickling inhibitors
- 5 Anticorrosion agents
- Antistatics
- Stabilizers
- Release agents
- Lubricants
- 10 Flameproofing agents
- UV absorbers
- Antiknocking agents
- Corrosion inhibitors
- Metal deactivators
- 15 Carburettor cleaning agents
- Residue converters
- Antiicing agents
- Pour point depressors
- Defoamers
- 20 Lubricity improvers
- Optical brighteners

Antifoams:

- Anionic surfactants
- Polyethylene ethers
- 25 Polypropylene glycol ethers
- Pluronic®
- Mixed ethers

Inorg. peroxides:

- Hydrogen peroxide
- Lithium peroxide
- Sodium peroxide
- 5 Calcium peroxide
- Strontium peroxide
- Barium peroxide

Org. peroxides:

- 10 Di-tert-butyl peroxide
- Dibenzoyl peroxide
- Per-acids
- Per-acid esters
- Ketone peroxides
- Epidioxides
- 15 Ascaridol
- Ergosterol peroxide

Stabilizers:

- Ethylenediaminetetraacetic acid
- Magnesium silicate

20 Plasticizers:

- Camphor
- Trimellitic acid
- Phosphoric acid esters
- Azelaic acid esters
- 25 Sebacic acid esters
- Chloroparaffins
- Dioctyl phthalate
- Bis-(2-ethylhexyl) phthalate
- Diisononyl phthalate
- 30 Diisodocecylyl phthalate
- Phthalic acid esters
- Dibutyl phthalate

Diisobutyl phthalate
Dicyclohexyl phthalate
Dimethyl phthalate
Diethyl phthalate
5 Benzyl butyl phthalate
Butyl octyl phthalate
Butyl decyl phthalate
Dipentyl phthalate
Dimethylglycol phthalate
10 Dicapryl phthalate
Trimellitic acid esters
Tris-(2-ethylhexyl) trimellitate
Dioctyl adipate
Bis-(2-ethylhexyl) adipate
15 Diisodecyl adipate
Dibutyl sebacate
Dioctyl sebacate
Bis-(2-ethylhexyl) sebacate
Azelaic acid
20 Sebacic acid
1,3-Butanediol
1,2-Propanediol
1,4-Butanediol
1,6-Hexanediol
25 Tricresyl phosphate
Triphenyl phosphate
Diphenyl cresyl phosphate
Diphenyl octyl phosphate
Bis-(2-ethylhexyl)diphenyl phosphate
30 Tris-(2-ethylhexyl) phosphate
Tris-(2-butoxyethyl) phosphate
Butyl oleate
Butyl stearate
Triethylene glycol bis-(2-ethylbutyrate)
35 Citric acid esters
Acetyltributyl citrate
Acetyltriethyl citrate

Tartaric acid esters
Lactic acid esters
Epoxystearic acid esters
Epoxidized soya oils
5 Linseed oils
Benzenesulfonamides
p-Toluenesulfonamides

Free radical interceptors:

Nitrogen monoxide
10 Bis(trifluoromethyl) nitroxide
Nitroxyl radicals
2,2-Diphenyl-1-picrylhydrazyl
Nitrosobenzene
2-Methyl-2-nitroso-propane
15 Benzaldehyde tert-butyl nitrone

Wetting agents can be:

Dimethyloctylphosphine oxide
Dimethylnonylphosphine oxide
20 Dimethyldecylphosphine oxide
Dimethylundecylphosphine oxide
Dimethyldodecylphosphine oxide
N,N,-bis (3-D-gluconamidopropyl)cholamide
N,N-Bis (3-D-gluconamidopropyl)deoxycholamide
25 Dodecylpoly(oxyethylene glycol ether)s,
PEG (23) dodecyl ether,
PEG (10) cetyl alcohol
PEG (20) cetyl alcohol
PEG (10) stearyl alcohol
PEG (10) oleyl alcohol
PEG (29) oleyl alcohol
30 Polyethylene glycol (10) lauryl ether
Polyethylene glycol (8) dodecyl ether
Polyethylene glycol (10) isotridecyl ether

- Polyethyleneglycol (15) isotridecylether
 Ethylphenol-poly(ethylene glycol ether)s
 Lubrol
 Thesit
 5 Thesit
 Cetylpyridinium chloride
 Cetyltrimethylammonium bromide
 3-[(3-Cholamidopropyl)dimethylammonio]-1-propanesulfonic acid
 10 3-[(3-Cholamidopropyl)dimethylammonio]-1-hydroxypropanesulfonic acid
 Chenodeoxycholic acid
 Cholate, Na⁺
 Deoxycholate, Na⁺
 15 Glycocholate, Na⁺
 Glycodeoxycholate, Na⁺
 Taurocholate, Na⁺
 Taurodehydrocholate, Na⁺
 Taurodeoxycholate, Na⁺
 20 Cyclohexyl-n-ethyl-β-D-maltoside
 Cyclohexyl-n-hexyl-β-D-maltoside
 Cyclohexyl-n-methyl-β-D-maltoside
 n-Decyl-β-D-maltopyranoside
 n-Dodecyl-beta-D-maltopyranoside
 25 n-Octyl-β-D-maltopyranoside
 n-Undecyl-β-D-maltoside
 N,N-Dimethyldecylamine oxide
 Genaminox KC
 N,N-Dimethyldodecylamine oxide
 30 N-Dodecyl-N,N-(dimethylammonio)butyrate
 N-Dodecyl-N,N-(dimethylammonio)undecanoate
 n-Dodecyl-N,N-dimethylglycine
 N-Octyl-N,N-dimethylammonio-3-propanesulfonate
 N-Decyl-N,N-dimethylammonio-3-propanesulfonate
 35 N-Dodecyl-N,N-dimethylammonio-3-propanesulfonate
 N-Tetradecyl-N,N-dimethylammonio-3-propanesulfonate
 Decanoylsucrose

- n-Dodecanoysucrose
Octanoysucrose
n-Decyl- β -D-glucopyranoside
Dodecyl- β -D-glucopyranoside
5 n-Heptyl- β -D-glucopyranoside
n-Hexyl- β -D-glucopyranoside
n-Nonyl- β -D-glucopyranoside
n-Octanoyl- β -D-glucosylamine
n-Octyl-beta-D-glucopyranoside
10 n-Decyl- β -D-thiomaltoside
n-Nonyl-beta-D-thiomaltopyranoside
N,N-Bis(3-D-gluconamidopropyl)deoxycholamide
N,N,-bis(3-D-gluconamidopropyl)cholamide
Digitonin
15 Bis(2-ethylhexyl)sodium sulfosuccinate
n-Dodecyl-N,N-dimethylglycine
6-O-(N-heptyl-carbamoyl)methyl- α -D-glucopyranoside
N-Dodecanoyl-N-methylglycine
Lauryl-sulfate Li⁺
20 Lauryl-sulfate, Na⁺
(3-([4-tert-Octyl]-1-propanesulfonic acid, Na⁺
n-Octanoyl-N-methylglucamide
n-Nonanoyl-N-methylglucamide
n-Decanoyl-N-methylglucamide
25 Ethylphenol-poly(ethylene glycol ether)s
n-Octyl-2-hydroxyethylsulfoxide
n-Octyl-2-hydroxyethyl sulfide
n-Octyl-rac-2,3-dihydroxypropylsulfone
n-octyl-rac-2,3-dihydroxypropylsulfoxide
30 Polyethylene glycol-polypropylene glycol copolymer
Pluronic F-127
 β -D-Fructopyranosyl-alpha-D-glucopyranoside monodecanoate
β-D-Fructopyranosyl-alpha-D-glucopyranoside monododecanoate
PEG (9-10) nonylphenol
35 PEG (4.5) p-t-octylphenol
PEG (9-10) p-t-octylphenol
PEG (9-10) p-t-octylcyclohexyl

PEG (7-8) p-t-octylphenol
PEG (7-8) t-octylcyclohexyl

Plant protection agents can be:

Herbicides	Insecticides	Fungicides	Other
2,4-D	Abamectin	Acibenzolar	Chlormequat
2,4-DB	Acephate	Azoxystrobin	Chloropicrin
Acetochlor	Acequinocyl	Benalaxyl	Choline Chloride
Acifluorfen	Acetamiprid	Benomyl	Cyclanilide
Aclonifen	Acrinathrin	Bitertanol	Dazomet
Alachlor	Alanycarb	Bromuconazole	Dichlopropene
Alloxidim	Aldicarb	Bupirimate	Dikegulac
Ametryn	Alpha-cypermethrin	Captan	Dimethipin
Amidosulfuron	Amitraz	Carbendazim	Ethepon
Aminotriazole	Azinphos-methyl	Carboxin	Flumetralin
Anilofos	Azocyclotin	Carpropamid	Gibberellic acid
Asulam	Bacillus thuringiensis	Chlorothalonil	Inabenfide
Atrazine	Bendiocarb	Chlozolinate	Maleic hydrazide
Azimsulfuron	Benfuracarb	Copper fungicides	Mepiquat
Benazolin	Bensultap	Cymoxanil	Metam
Benfluralin	Benzoximate	Cyproconazole	Methyl bromide
Benfuresate	Bifenazate	Cyprodinil	Methyl isothiocyanate
Bensulforon	Bifentrin	Dichlofluanid	Paclobutrazol
Bentazone	BPMC (Fenobucarb)	Diclomezine	Prohexadione
Benzofenap	Bromopropylate	Diethofencarb	Thidiazuron
Bifenoxy	Buprofezin	Difenoconazole	Triapenthalol
Bilanafos	Cadusafos	Dimethirimol	Tributyl phosphorotri-thioate
Bispyribac-sodium	Carbaryl	Dimethomorp	Trinexapac-ethyl
Bromacil	Carbofuran	Diniconazole	Uniconazole
Bromobuthide	Carbosulfan	Dinocap	Fluthiacet - KIH 9201 / CGA 248757
Bromofenoxim	Cartap	Dithianon	

Bromoxynil	Chinomathionat	Dodemorph	
Butachlor	Chlorethoxyfos	Dodine	
Butamifos	Chlorfenapyr	Edifenphos	
Butralin	Chlorfenvinphos	Epoxiconazole	
Butroxydim	Chlorfluazuron	Ethaboxam	
Butylate	Chlormephos	Ethirimol	
Cafenstrole	Chloropirifos	Etridiazole	
Carbentamide	Clofentezine	Famoxadone	
Carfentrazone	Cycloprothirin	Fenarimol	
Chlorbromuron	Cyfluthrin	Fenbuconazole	
Chloridazon	Cyhexatin	Fenhexamid	
Chlorimuron	Cypermethrin	Fenitropan	
Chlorotoluron	Cyromazine	Fenpiclonil	
Chlorsulfuron	Deltamethrin	Fenpropidin	
Chlorthal	Demeton-s-methyl	Fenpropimorph	
Cinidon-ethyl	Diafenthiuron	Fentin	
Cinmethylin	Diazinon	Ferimzone	
Cinosulfuron	Dichlorvos	Fluazinam	
Clefoxydim	Dicofol	Fludioxonil	
Clethodim	Dicrotophos	Fluoroimide	
Clodinafop	Diflubenzuron	Fluquinconazole	
Clomazone	Dimethoate	Flusilazole	
Herbicides	Insecticides	Fungicides	PGR
Clomeprop	Disolfoton	Flusulfamide	Aminoethoxy-vinylglycine
Clopyralid	Emamectin benzoate	Flutolanil	Prohydrojasmon - PDJ
Cloransulam-methyl	Endosulfan	Flutriafol	
Cumyluron	Esfenvalerate	Folpet	
Cyanazine	Ethiofencarb	Fosetyl	
Cyclosulfamuron	Ethion	Fuberidazole	
Cycloxydim	Ethoprophos	Furalaxyl	
Cyhalofop-butyl	Etofenprox	Furametpyr	
Daimuron	Etoxazole	Guazatine	
Desmedipham	Etrrimfos	Hexaconazole	

Desmetryn	Fenamiphos	Hymexazol
Dicamba	Fenazaquin	Imazalil
Dichlobenil	Fenbutatin oxide	Imibenconazole
Dichlorprop	Fenitrothion	Iminoctadine
Diclofop	Fenothiocarb	Ipconazole
Diclosulam	Fenoxy carb	Iprobenfos
Difenzquat	Fenpropothrin	Iprodione
Diflufenican	Fenpyroximate	Iprovalicarb
Diflufenzopyr	Fenthion	Isoprothiolane
Dimefuron	Fenvaleate	Kasugamycin
Dimepiperate	Fipronil	Kresoxim-methyl
Dimethachlor	Flubrohythirinate	Mancozeb
Dimethenamid	Flucycloxuron	Maneb
Diphenamid	Flucythrinate	Mepanipyrim
Diquat	Flufenoxuron	Mepronil
Dithiopyr	Flutenzine	Metalaxyd
Diuron	Fluvalinate	Metconazole
Endothal	Formetanate	Methasulfocarb
EPTC	Formothion	Metiram
Esprocarb	Fosthiazate	Myclobutanil
Ethalfluralin	Furathiocarb	Nitrothal-isopropyl
Ethametsulfuron	Halfenbrox	Nuarimol
Ethofumesate	Halofenozide	Oxadixyl
Ethoxyfen	Hexaflumuron	Oxine-copper
Ethoxysulfuron	Hexythiazox	Oxolinic acid
Etobenzanid	Imidacloprid	Oxycarboxin
Fenoxaprop	Indoxacarb	Pefurazoate
Flamprop-M	Isofenphos	Penconazole
Flazasulfuron	Isoprocarb	Pencycuron
Fluazifop	Isoxathion	Phthalide
Flufenacet	Lambda-cyhalothrin	Probenazole
Flumetsulam	Lindane (Gamma-HCH)	Prochloraz
Flumiclorac-	Lufenuron	Procymidone

pentyl			
Flumioxazin	Malathion	Propamocarb	
Fluometuron	Metaldehyde	Propiconazole	
Fluoroglycofen	Methamidophos	Propineb	
Flupoxam	Methidathion	Pyrazophos	
Flupyrsulfuron	Methiocarb	Pyrifenoxy	
Herbicides	Insecticides	Fungicides	Nematicides
Flurenol	Methomyl	Pyrimethanil	ZA3274
Fluridone	Methoprene	Pyroquilon	
Flurochloridone	Methoxyfenozide	Quinoxifen	
Fluroxypyr	Mevinphos	Quintozene	
Flurtamone	Milbemectin	Spiroxamine	
Fomesafen	Monocrotophos	Streptomycin	
Glufosinate	Nitenpyram	Sulfur	
Glyphosate	Novaluron	Tebuconazole	
Halosulfuron	Omethoate	Tecloftalam	
Haloxyfop	Oxamyl	Tetraconazole	
Imazamethabenz	Oxydemeton-methyl	Thiabendazole	
Imazamox	Parathion	Thifluzamide	
Imazapic	Parathion-methyl	Thiophanate-methyl	
Imazapyr	Permethrin	Thiram	
Imazaquin	Phenthroate	Tolclofos-methyl	
Imazethapyr	Phorate	Tolylfluanid	
Imazosulfuron	Phosalone	Triadimefon	
Isoprothuron	Phosmet	Triadimenol	
Isoxaben	Phosphamidon	Tricyclazole	
Isoxaflutole	Phoxim	Tridemorph	
Lactofen	Pirimicarb	Triflumizole	
Lenacil	Pirimiphos-ethyl	Triforine	
Linuron	Pirimiphos-methyl	Triticonazole	
MCPA	Profenofos	Validamycin	
MCPA-thioethyl	Propaphos	Vinclozolin	
MCPB	Propargite	Zineb	
Mecoprop	Propoxur	Ziram	

Mefenacet	Prothiofos	Cyamidazosulf-amid - IKF-916	
Metamitron	Pymetrozine		
Metazachlor	Pyraclofos	Cyamidazosulf-amid- IKF-916	
Methabenzthiazuron	Pyridaben		
Methyl-arsonic acid	Pyridafenthion	Diclocymet - S2900	
Metobromuron	Pyrimidifen	Fenamidone - RPA 407213	
Metolachlor	Pyriproxyfen		
Metosulam	Quinakphos	Fenoxyanil - AC382042 /NNF9425	
Metoxuron	Silafluofen		
Metribuzin	Spinosad	Iprovalicarb- SZX722	
Metsulfuron	Sulprofos	MA 565	
Molinate	Tebufenozide	Metominostrobin - SSF-126	
Naproanilide	Tebufenpyrad		
Napropamide	Tébupirimfos	MTF-753	
Naptalam	Teflubenzuron	NF-149	
Nicosulfuron	Tefluthrin	NNF-9850	
Norflurazon	Terbufos	Oxpoconazole fumarate - UBF-910	
Orbencarb	Thiamethoxam		
Oryzalin	Thiocyclam	Picoxystrobin - ZA1963	
Oxadiargyl	Thiodicarb		
Oxadiazon	Thiometon		
Herbicides	Insecticides	Fungicides	
Oxasulfuron	Tralomethrin	Silthiopharm - MON-65500	
Oxyfluorfen	Triazamate		
Paraquat	Triazophos	Simeconazole - F155	
Pendimethalin	Trichlorfon	Trifloxystryrobin	

		- OGA279202
Pentoxazone	Triflumuron	
Phenmedipham	Vamidothion	Zoxamide - RH7281
Picloram	Xylol methylcarbamate	
Pretilachlor	Zeta-Cypermethrin	
Primisulfuron	Acetoprole-RPA115782	
Prometryn	AKD 1022	
Propachlor	Chromafenozone-ANS-118	
Propanil		
Propaqizafop	Clothianidin - TI-435	
Propazine	Dinitefuran - MTI-446	
Propyzamide	Ethiprole-RPA 107382	
Prosulfocarb	Fluacrypyrim - NA-83	
Prosulfuron	Flupyrazofos	
Pyraflufen-ethyl	Phosphocarb - BAS301	
Pyrazolinate		
Pyrazosulfuron	Protrifenbute - FMC 111869	
Pyrazoxyfen		
Pyribenzoxim	Thiacloprid - BAYYRC2894	
Pyributicarb		
Pyridate	Tolfenpyrad - OMI-88	
Pyriminobac-methyl		
Pyriproxyfen		
Quinclorac		
Quinmerac		
Quinoclamine		
Quizalofop		

Quizalofop-P-tefuryl		
Rimsulfuron		
Sethoxydim		
Simazine		
Sulcotrione		
Sulfentrazone		
Sulfometuron		
Sulfosate		
Sulfosulfuron		
Tebuthiuron		
Terbacil		
Terbumeton		
Terbutylazine		
Terbutryn		
Thenylchlor		
Thiazopyr		
Thifensulfuron		
Thiobencarb		
Herbicides		
Tralkoxydim		
Triallate		
Triasulfuron		
Tribenuron		
Triclopyr		
Trifluralin		
Triflusulfuron		
Amicarbazone-BAYMKH3586		
Azafenidin-DPX-R6447		
Beflubutamid-UBH-820		
Benzfendizone - FMC 143686		
Benzobicyclon -SB-500		
Butafenacil - CGA 276854		
Fentrazamide - BAYYRC2388		
Florasulam - DE570		

Fluazolate - JV485
Flucarbazone - BAYMKH6562
Flufebpyr-ethyl - S-3453
Foramsulfuron - AEF 130360
Indanofan - MK-243
Iodosulfuron - AEF 115008
Isoxadifen - AEF122006
KPP421
Mesosulfuron - AEF 130060
Mesotrione - ZA1296
MTB-951
OK-9701
Oxaziclomefone-MY-00
Penoxsulam - DE638
Pethoxamid - TKC-94
Picolinofen - AC900001
Propoxycarbazone (proposed) BAYMKH6561
Pyriftalid - CGA279233
Tepraloxydim - BAS620H/NP61EC
Triaziflam - IDH 1105
Trifloxysulfuron (Na salt) - CGA362622
Tritosulfuron

Preferably, however, the silicon dioxide granules employed according to the invention function as a carrier. The 5 present invention therefore also relates to an adsorbate of the silicon dioxide granules described above and at least one of these substances.

The term "adsorbate" as used herein includes the adsorption of a substance not only on to the surface of the silicon 10 dioxide, but also into the pores, as well as the

"intercalation" into the intergrain volumes. "Adsorbate" can also mean that silicon dioxide granules or fragments thereof envelop solid particles or liquid droplets of the substance. In the latter case the forces of attraction
5 between the particles or droplets are reduced and, for example, the flow properties are improved or the merging of droplets is impeded.

- The ratio of amounts of substance to silicon dioxide granules in the adsorbate can be chosen as desired as a
10 function of the properties of the substance and the requirements for the end product. Preferably, however, 0.001 to 200 g of substance are employed per 100 g of silicon dioxide granules, particularly preferably 10 to 150 g.
15 In a preferred embodiment, granules based on pyrogenically prepared silicon dioxide of average particle diameter from 10 to 120 μm and BET surface area from 40 to 400 m^2/g (determination in accordance with DIN 66 131 with nitrogen) can be used as the silicon dioxide granules.

20

The silicon dioxide granules furthermore preferably have the following physico-chemical characteristic data, which are determined as described in EP PS 0 725 037:

Pore volume: 0.5 to 2.5 ml/g

- 25 Pore size volume: less than 5% of the total pore volume has a pore diameter of less than 5 nm, remainder meso- and macropores

pH: 3.6 to 8.5

Tamped density: 220 to 700 g/l.

30

Granules which are suitable for the use according to the invention and the preparation thereof are described, for example, in EP OS 0 727 037.

An example of a process for the preparation of the
5 adsorbate according to the invention comprises:

Melting of the substance(s) to be adsorbed, chosen from foodstuffs additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents, such as, for example, herbicides, insecticides and fungicides, or distribution, i.e. dissolving, suspending or emulsifying, thereof in a
10 solvent;
15

mixing of the granules based on pyrogenically prepared silicon dioxide with the mixture from step (a); and where appropriate removal of the solvent.

"Solvent" also includes mixtures of several different
20 solvents. It goes without saying, furthermore, that substances which are already liquid at room temperature can be subjected to the mixing in step (b) without prior processing, since in this case the "melting operation" has already taken place. Mixing step (b) can be carried out
25 either by adding the mixture from step (a) to the silicon dioxide granules, for example by spraying on, or vice versa. In both cases, the addition can be made in one amount or in portions. The duration of the mixing in step (b) depends here above all on the adsorption properties of
30 the substance to be adsorbed on the silica surface. If a solvent is present, step (a) and (b) are carried out at a temperature which lies between the freezing and boiling point of the solvent. The solvent, where appropriate in

excess, is preferably removed in step (c) at elevated temperature and/or under reduced pressure.

The removal of the solvent in step (c) can also be carried out by spray drying or fluidized bed drying, shaping taking 5 place at the same time. In the case of a granule-containing melt, the shaping process can accordingly be an extrusion.

The adsorbates according to the invention can be used for the preparation of powders, liquids, foams, sprays, gels, creams, ointments, pastes, sticks and tablets.

10 The adsorbates according to the invention can additionally be shaped. They can be processed, for example, to pellets, larger granules, extrudates etc.

The advantage of the adsorbates according to the invention lies in their excellent flow properties, the low water 15 content and the high purity of the starting granules. They offer a very good possibility for dispersing substances which are difficult to meter, and are easy to handle.

When handling the adsorbates, the hazard potential to the administering person during use on toxic substances, such 20 as plant protection agents or aggressive skin-irritating substances, can be reduced significantly.

When the adsorbate according to the invention is used, a uniform distribution of the active compound can be achieved.

25 The invention is now to be explained in more detail with the aid of examples.

Preparation of granules based on pyrogenically prepared silicon dioxide

The pyrogenically prepared silicon dioxide AEROSIL 300, commercially obtainable from Degussa AG, is used as the
5 starting compound.

The pyrogenically prepared silicon dioxide is dispersed in completely demineralized water. A dispersing unit which operates by the rotor/stator principle is used here. The suspension formed is spray dried. The finished product is
10 separated off via a filter or cyclone. The heat treatment of the spray granules is carried out in a muffle oven.

The preparation parameters are shown in table 1.

Table 1

Starting SiO ₂	AEROSIL 300
Spray drying data	
Amount of H ₂ O (kg)	100
Amount of SiO ₂ (kg)	10
Atomization with	disc atomizer
Operating temperature (°C)	480°C
Waste air temperature (°C)	103°C
Separation	filter
Physico-chemical data	
BET surface area (m ² /g)	298
Particle size d ⁵⁰ (μm)	30
Tamped volume (g/l)	283
pH	4.7

Examples**1. Starting materials****1.1 Model liquids**

Vitamin E acetate, silicone oil, paraffin oil and 5 eucalyptus oil are used as model liquids for the fields of use according to the invention. Vitamin E acetate is used, for example, in the nutrition of animals and humans, and eucalyptus oil as an aromatic or aroma substance.

Example	Product	Product name	Manufacturer
1	Vitamin E acetate		BASF
2	Silicone oil	Silicon Fluid 345	Dow Corning
3	Paraffin oil	Paraffinöl dünflüssig	Merck
4	Eucalyptus oil	Oleum Eucalypti 80-85%	Caelo

1.2 Carrier silicas

Silica	Loss on drying (wt.%)	Loss on ignition (wt.%)	SiO ₂ content (wt.%)	Slope angle (°)	Bulk density (g/l)
Example 1-4 AEROPERL® 300/30 (Degussa)	1.7	2.1	99.9	34.97	232.8
Comparison example 1 SIPERNAT® 22 (Degussa)	4.8	4.4	98.0	38.99	211
Comparison example 2 SIPERNAT® 50 (Degussa)	4.5	4.9	98.5	52.67	136.67
Comparison example 3 Syloid 244 FP (Grace)	5.9	3.9	nd	50	92

Granulated pyrogenic silica (AEROPERL® 300/30) has a significantly lower water content (loss on drying and ignition) and a higher silicon dioxide content than the silicas used in the comparison examples. Furthermore, it is free from sulfates, typical impurities of precipitated silica and silica gels, and has the best flowability (the lowest slope angle).

10 2. Procedure:

50 g of carrier silica are initially introduced into a 2 litre three-necked flask equipped with a blade stirrer.

50 g of the model liquids from examples 1-4 are added dropwise from a dropping funnel in the course of 60

15 minutes, while stirring at a stirrer speed of 100 revolutions / minute. Comparison examples 1-3 are carried out with eucalyptus oil. The liquid-silica adsorbates are

then sieved manually three times through a 0.8 mm sieve and left to stand overnight in a closed screw-cap glass bottle. The following day, the liquid-silica adsorbates are characterized by the following methods:

5

Flow rating by means of glass flow vessels in accordance with the publication series Pigmente No. 31 "AEROSIL zur Verbesserung des Fließverhaltens pulverförmiger Substanzen", Degussa AG, Düsseldorf.

- 10 Poured cone height (cm) or slope angle ($^{\circ}$) in accordance with the publication series Pigmente No. 31. The slope angle is obtained from the poured cone height via the equation
$$\tan(\text{slope angle}) = (\text{poured cone height}/0.5 \text{ cone diameter})$$
- 15 Bulk density (g/l) in accordance with DIN standard 6613.

3. Results

	Flow rating	Slope angle (°)	Bulk density (g/l)
Example 1 AEROPERM / Vitam. E	2	30.1	501
Example 2 AEROPERM / Silicone oil	2	37.2	475
Example 3 AEROPERM / Paraffin oil	2	38.7	497
Example 4 AEROPERM / Eucalyptus oil	2	37.2	594
Comparison example 1 SIPERNAT 22	3	46.0	450
Comparison example 2 SIPERNAT 50	4	63.9	353
Comparison example 3 Syloid FP 244	6	56.7	201

The liquid-silica adsorbates prepared with granulated pyrogenic silica (AEROPERM® 300/30) are distinguished by a 5 good flowability (flow rating 2, slope angle < 40°C). In contrast, the liquid-silica adsorbates from comparison examples 1 to 3 show a significantly lower flowability. The latter moreover have significantly lower bulk densities.

Liquid-silica adsorbates with a good flowability and high 10 bulk volume are advantageous for carrier uses. Furthermore, carrier silicas should have the lowest possible water content and should be very pure, in order to avoid decomposition of the adsorbed liquids under the (catalytic) influence of water or impurities, such as, for example,

sulfates. The experiments show that granulated pyrogenic silica meets all these requirements.

Patent claims:

1. Use of granules based on pyrogenically prepared silicon dioxide as a carrier for substances chosen from the group consisting of foodstuffs additives, such as
5 dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives, chemical intermediates and plant protection agents,
10 such as, for example, herbicides, insecticides and fungicides.
2. Use according to claim 1, characterized in that the silicon dioxide granules are silanized.
3. Adsorbate of granules based on pyrogenically prepared
15 silicon dioxide and at least one substance chosen from the group consisting of foodstuffs additives, such as dyestuffs, antioxidants, preservatives, emulsifiers, gelling agents, thickeners and binders, stabilizers, alkalis, acids, salts, antilumping agents, flavour intensifiers, sweeteners, aromas, feedstuffs additives,
20 chemical intermediates and plant protection agents, such as herbicides, insecticides and fungicides.
4. Adsorbate according to claim 3, characterized in that the silicon dioxide granules are silanized.
- 25 5. Dyestuff comprising granules based on pyrogenically prepared silicon dioxide.
6. Antioxidant comprising granules based on pyrogenically prepared silicon dioxide.
- 30 7. Preservative comprising granules based on pyrogenically prepared silicon dioxide.

8. Emulsifier comprising granules based on pyrogenically prepared silicon dioxide.
9. Gelling agent comprising granules based on pyrogenically prepared silicon dioxide.
- 5 10. Thickener comprising granules based on pyrogenically prepared silicon dioxide.
11. Binder comprising granules based on pyrogenically prepared silicon dioxide.
12. Stabilizer comprising granules based on pyrogenically prepared silicon dioxide.
- 10 13. Alkali comprising granules based on pyrogenically prepared silicon dioxide.
14. Acids comprising granules based on pyrogenically prepared silicon dioxide.
- 15 15. Salts comprising granules based on pyrogenically prepared silicon dioxide.
16. Antilumping agent comprising granules based on pyrogenically prepared silicon dioxide.
17. Flavour intensifier comprising granules based on pyrogenically prepared silicon dioxide.
- 20 18. Sweetener comprising granules based on pyrogenically prepared silicon dioxide.
19. Aroma comprising granules based on pyrogenically prepared silicon dioxide.
- 25 20. Feedstuffs additives comprising granules based on pyrogenically prepared silicon dioxide.
21. Chemical intermediates comprising granules based on pyrogenically prepared silicon dioxide.

22. Plant protection agents comprising granules based on pyrogenically prepared silicon dioxide.
23. Herbicides comprising granules based on pyrogenically prepared silicon dioxide.
- 5 24. Insecticides comprising granules based on pyrogenically prepared silicon dioxide.
25. Fungicides comprising granules based on pyrogenically prepared silicon dioxide.

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP2004/006719

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 C01B33/18 B01J20/10 C09C1/30
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C01B B01J C09C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

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Patent family members are listed in annex.

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